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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/516,482 | 03/01/2000 | Joseph M. DeSimone | 5051-460IP | 3128 |

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| EXAMINER |
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BISSETT, MELANIE D

| ART UNIT | PAPER NUMBER |
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1711
DATE MAILED: 11/28/2001 /D

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|-------------------------------------|------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/516,482 | DESIMONE ET AL. |
| | Examiner Melanie Bagwell-Bissett | Art Unit 1711 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 27 August 2001.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-15, 17-21, 23-38, 40-44, 46 and 65-122 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-15, 17-20, 23-38, 40-43, 46, 65-74, 77-81, 85-88, 91-96, 98-102, 105-108, 112, 113 and 116-121 is/are rejected.
- 7) Claim(s) 17-21, 40-44, 75, 76, 82-84, 89, 90, 97, 103, 104, 109-111, 114, 115 and 122 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 - a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

DETAILED ACTION

1. The rejections using Humphrey, Jr. et al. have been withdrawn and replaced by rejections based on 35 USC 103. Additionally, the Weisman reference has been applied to newly added claims, and new rejections have been added using WO 99/47603. For clarification, it is noted that claims 22 and 45 were previously rejected by Weisman and also indicated as allowable if rewritten in independent form. This is because the search was expanded beyond the applicant's elected species to reject the claims. However, it has been the examiner's position that the claims would be allowable if rewritten in independent form and to indicate the applicant's elected species.

Specification

2. The disclosure is objected to because of the following informalities:

3. The description of Figure 1 on pp. 17-18 indicates parts 70, 80, 90, 100, and arrows x and y. However, labels for the indicated parts and arrows are not present on Figure 1. Appropriate correction is required. Although the applicant has indicated that an amended Figure 1 has been submitted, an amended Figure 1 cannot be found in the current file.

Election/Restrictions

4. Applicant's election without traverse of PVDF (first thermoplastic) and PMMA (second thermoplastic) in Paper No. 6 is acknowledged.

Claim Rejections - 35 USC § 102

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 73-74, 77-81, 85-88, 91-96, 98-102, 105-108, 112-113, 116-121 are rejected under 35 U.S.C. 102(b) as being anticipated by Weisman. In this case, the search has been expanded to include other thermoplastics.
7. Support for these rejections can be found in a prior Office action, paragraphs 9-13. The newly submitted claims add a surfactant limitation to cancelled claims 47-64. Thus, the rejection of the new claims parallels the previous rejection of now cancelled claims.
8. Additionally, PVC is known in the art as an amorphous material. Since the blend contains both a semi-crystalline and amorphous material, the blend would inherently have amorphous regions from both polymers. Thus, the blend is amorphous.
9. New claims 94-96 and 119-121 limit the blowing agent used in the method. The Weisman reference suggests the use of water or hydrocarbon blowing agents in the invention, where water would react to form carbon dioxide. The hydrocarbon blowing agents mentioned include aliphatic hydrocarbons having 1-9 carbon atoms and halogenated hydrocarbons having 1-4 carbon atoms (col. 6 lines 50-68).

Art Unit: 1711

10. Claims 1-2, 7, 10-11, 23-25, 28, 33, 35-36, 46, 65-66, and 69-70 are rejected under 35 U.S.C. 102(b) as being anticipated by Shell International. Shell International (WO 99/47603) can be found on the applicant's Form PTO-1449.

11. Shell discloses closed cell foams comprising a thermoplastic blend of PET and polycarbonate (see examples). Because the thermoplastic materials have different molecular structures, it is the examiner's position that one polymer inherently possesses a higher percent crystallinity than the other. The polyester polymers are noted to be crystallizable, while the polycarbonate polymers are aromatic (abstract), suggesting the PET component would have a higher crystallinity than the polycarbonate. Example 1 shows foams made by mixing thermoplastic polymers in an extruder barrel, heating the mixture to melt, contacting the polymer blend with nitrogen gas in a mixing section, and extruding the mixture to yield a closed-cell foam. Thus, the gas creates a thermodynamic instability in the mixture, and the mixture, since it is a blend of two different polymers, inherently has a lower percent crystallinity than that of the most crystalline polymer.

12. Inert gases including carbon dioxide are preferred as blowing agents (p. 18 lines 12-18). PET is a known semi-crystalline material, thus teaching a mixture where at least one material is semi-crystalline. The reference teaches the addition of components such as dyes, pigments, and flame retardants in the invention (p. 17 line 31-p. 18 line 5).

Claim Rejections - 35 USC § 103

13. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
14. Claims 1-2, 4-15, 23, and 65-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al.
15. From a previous Office action:

Humphrey discloses an electrode comprising a porous or foamed polyvinylidene fluoride (col. 4 lines 41-57) stabilized to inhibit crystallization and improve conductivity (col. 7 lines 19-23 and 46-52). Thus, the stabilized PVDF is less crystalline than the initial PVDF. Humphrey teaches the addition of PMMA for increasing adhesion of PVDF to metallic conductors (col. 5 lines 44-49), thus forming a PVDF/PMMA blend. PVDF has been shown as a semi-crystalline polymer by the need for amorphous stabilization, and PMMA is a known amorphous polymer. Supercritical carbon dioxide is preferred as a blowing agent (col. 9 lines 21-36) for forming open cell foams, where the blowing agent is incorporated into the polymer and allowed to expand. This expansion results from a thermodynamic instability; because the carbon dioxide is incorporated under supercritical conditions, one skilled in the art would clearly envision the expansion resulting from a change in pressure and temperature of the mixture. Also, because the foams are open cell porous foams, one skilled in the art would clearly envision the carbon dioxide venting from the created pores or cells, thus separating from the mixture.

16. However, the reference does not exemplify making porous foamed materials having a plurality of distinct voids. The reference does suggest that closed-cell porous foams and foams having both open and closed cells may be formed by the invention (col. 4 lines 53-57), noting that the mobility of electrolyte is increased with an open structure. One skilled in the art would recognize that including amounts of closed cells in the foams would provide a means for controlling the mobility of electrolyte. It is thus the examiner's position that it would have been *prima facie* obvious to provide closed

cells within the porous structure to control the mobility of the electrolyte and thus control the conductivity of the system.

17. From a prior Office action:

Humphrey teaches the inhibited crystallization of the PVDF polymers but does not mention a mixture of stabilized PVDF and PMMA as an amorphous blend. Humphrey indicates the conductivity as inversely related to the crystallinity of the PVDF (col. 7 lines 46-52). Therefore, it is the examiner's position that it would have been *prima facie* obvious to form a polymer blend having any amount of crystallinity to produce a foam with the desired conductivity. Since Humphrey indicates a desire to improve conductivity, it would have been *prima facie* obvious to form an amorphous blend to increase conductivity.

Humphrey teaches the addition of plasticizers and co-solvents in the invention (col. 8 lines 7-17), modifiers conventionally used to aid in processing by reducing viscosity and improving solubility, respectively. However, the reference does not mention the combination of the additives with the blowing agent. Combining the additives with the blowing agent would prevent the need to combine the additives individually. Thus, it is the examiner's position that it would have been *prima facie* obvious to add a co-solvent or plasticizer to the blowing agent composition in Humphrey's invention with the expectancy of forming a polymer foam with minimal additions.

18. Claims 24-28, 30-38, 46, and 69-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al. in view of Pecsok.

19. From a prior Office action:

Humphrey applies as above, lacking express mention of an extrusion process used for forming PVDF foams. Humphrey discloses a method of heating the polymer, incorporating supercritical carbon dioxide, and expanding the article. Pecsok discloses an extrusion method for PVDF polymers, where PVDF and additives are introduced into a powder blender, melt blended in a twin screw extruder, and extruded onto a wire. Thus, the mixing of the thermoplastics occurs in a mixing section of an extruder, and the components are melt blended. Because of the conventionality of the melt extrusion method, it is the examiner's position that it would have been *prima facie* obvious to mix the components of

Humphrey's invention in the melt in a mixing section of an extruder with the expectancy of beneficial results.

20. Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al. in view of van Cleeff.

21. From a prior Office action:

Humphrey applies as above, lacking express mention of the use of a surfactant in the invention. However, van Cleeff discloses mixtures of polyvinylidene fluoride in coating compositions, where surfactants are added to stabilize the dispersion of the polymer in a solvent in which the polymer is insoluble (col. 1 lines 33-42 and col. 2 lines 13-34). The reference chooses fluorosurfactants having both CO₂-philic and CO₂-phobic segments (col. 6 lines 17-42). For example, the reference teaches the use of surfactants of the formula X(CF₂)_nCOOH, having a CO₂-philic fluoropolymer segment and a CO₂-phobic acid functionality. Because the blend of Humphrey's invention contains both polar and non-polar components, one would clearly envision the addition of a surfactant as aiding the compatibility of the blend components with solvents and blowing agents involved. Thus, it is the examiner's position that it would have been *prima facie* obvious to add a surfactant by van Cleeff's teaching to the composition of Humphrey's invention in the expectancy of beneficial results.

22. Claims ⁴⁰ 39-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al. in view of Pecsok as applied to claims 24-28, 30-38, and 46 above, and further in view of van Cleeff.

23. From a prior Office action:

Humphrey and Pecsok apply as above, lacking express mention of the use of surfactants. The reference van Cleeff applies as above. For the same reasons as stated above, it is the examiner's position that it would have been *prima facie* obvious to add a surfactant by van Cleeff's teaching to the composition of Humphrey's invention in an extrusion process with the expectancy of beneficial results. The surfactant would serve to compatibilize the blend components with the solvents and blowing agent composition.

24. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al. in view of Boutillier et al.

25. From a prior Office action:

Humphrey applies as above, teaching the use of supercritical carbon dioxide but not liquid carbon dioxide as a blowing agent. Boutillier teaches the conventionality of liquid carbon dioxide as a foaming agent (col. 8 lines 41-51) for vinyl monomers such as vinylidene fluoride (col. 7 lines 55-68). It is thought that liquid carbon dioxide would be more cost effective than supercritical carbon dioxide, since liquid carbon dioxide does not require temperature control and pressurization to the extent that supercritical carbon dioxide requires. It is therefore the examiner's position that it would have been *prima facie* obvious to use liquid carbon dioxide as a blowing agent in Humphrey's invention to save energy required to keep carbon dioxide in a supercritical state.

26. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Humphrey, Jr. et al. in view of Pecsok as applied to claims 24-28, 30-38, and 46 above, and further in view of Boutillier et al.

Humphrey and Pecsok apply as above for the extrusion process, failing to mention the use of liquid carbon dioxide as a blowing agent. The reference van Cleeff applies as above. For the same reasons as stated above, it is the examiner's position that it would have been *prima facie* obvious to use liquid carbon dioxide as a blowing agent in the composition of Humphrey's invention in an extrusion process with the expectancy of beneficial results. The use of liquid carbon dioxide would serve to save energy required to keep carbon dioxide in a supercritical state.

27. Claims 67-68 and 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shell International.

28. Shell applies as above, lacking exemplification of organic or chemical blowing agents used in the invention. However, the reference does mention that halogenated gases and hydrocarbons having 1-9 carbon atoms may be used in the invention (p. 18 lines 12-18). The hydrocarbons mentioned have higher boiling points than the inert gases, making the hydrocarbons easier to combine with the molten materials with less pressurization. It is the examiner's position that it would have been *prima facie* obvious to use hydrocarbon blowing agents in Shell's invention to ease the processing of the materials. Also, the reference mentions that chemical blowing agents such as azocarbonamide may be used (p. 19 lines 20-24). Because these materials are solid at room temperature, one skilled in the art would recognize that one could easily control the amount of blowing agent added, and the blowing agent could be homogeneously incorporated into a molten plastic. It is therefore the examiner's position that it would have been *prima facie* obvious to use a chemical blowing agent such as azocarbonamide to facilitate dispersion into the plastic.

Claim Objections

29. Claims 17-21 and 40-44 are objected to because of the following informalities: The claims depend from cancelled claims. Appropriate correction is required.

Allowable Subject Matter

30. Claims 21, 44, 75-76, 82-84, 89-90, 97, 103-104, 109-111, 114-115, and 122 are objected to as being dependent upon a rejected base claim, but would be allowable if

rewritten in independent form including all of the limitations of the base claim and any intervening claims.

31. The following is a statement of reasons for the indication of allowable subject matter:

32. The search has been expanded to include all thermoplastic polymers. Claims 21 and 44 limit the surfactant present in the foam-forming method of claims 1 and 24 to comprise a CO₂-philic and specific CO₂-phobic segment. The remainder of the above-mentioned objected claims limit a method of combining a blowing agent comprising a surfactant copolymer. Limitations include specified blowing agents, specified groups of thermoplastic polymers, and specified CO₂-philic segments. Because claims 1 and 24 have been amended to specify void-containing foams, the rejections of claims 21 and 44 over Weisman et al. have been withdrawn. Weisman discloses polyurethane/PVC blend foams including siloxane block copolymer surfactants. However, the reference is drawn to the production of open-celled foams. Therefore, it is the examiner's position that the production of foams having closed cells made by the applicant's claimed methods using surfactants having specific CO₂-phobic segments is a novel, unobvious contribution over the prior art.

33. Regarding the method claims limiting the surfactant to a copolymer surfactant, Weisman indicates the use of copolymer surfactants but does not indicate the use of the applicant's specific chemical and physical blowing agents mentioned in the objected claims. Further, the reference does not mention the blending of two polymers from the applicant's claimed lists in the objected claims, and the reference does not specify the

use of fluoropolymer CO₂-philic segments in the surfactant. Therefore, it is the examiner's position that the use of the applicant's specified blowing agents, surfactants, or thermoplastic polymers in the applicant's claimed method including surfactant copolymers is a novel, unobvious contribution over the prior art.

Response to Arguments

34. Regarding the applicant's arguments that Humphrey, Jr. et al. and Weisman do not anticipate the claims because the claims now limit the foams to closed-cell foams, it is noted that the rejections using Humphrey, Jr. et al. have been changed to show obviousness of forming foams having closed cells. The rejections using Weisman have been withdrawn where the claims limit the foams to have closed cells. However, Weisman has been applied to newly added claims.

35. In response to the applicant's arguments that secondary references cannot cure the deficiencies of Humphrey, it is noted that Humphrey alone has been used to indicate obviousness of forming foams having closed cells.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melanie Bagwell-Bissett whose telephone number is (703) 308-6539. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Seidleck can be reached on (703) 308-2462. The fax phone numbers for the organization where this application or proceeding is assigned are (703)

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872-9310 for regular communications and (703) 872-9311 for After Final
communications.

Any inquiry of a general nature or relating to the status of this application or
proceeding should be directed to the receptionist whose telephone number is (703) 308-
0661.

mdb
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